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COMMITTEE ON THE PEACEFUL USES
OF OUTER SPACE

REPORT OF THE SCIENTIFIC AND TECHNICAL SUBCOMMITTEE ON THE WORK OF ITS THIRTY-FIRST SESSION

INTRODUCTION

1. The Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space held its thirty-first session at the United Nations Office at Vienna from 21 February to 3 March 1994 under the chairmanship of Professor J. H. Carver (Australia).

2. Representatives of the following Member States attended the session: Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Chile, China, Colombia, Czech Republic, Ecuador, Egypt, France, Germany, Greece, Hungary, India, Indonesia, Iran (Islamic Republic of), Iraq, Italy, Japan, Lebanon, Mexico, Morocco, Nigeria, Pakistan, Philippines, Poland, Romania, Russian Federation, Spain, Sudan, Sweden, Ukraine, United Kingdom of Great Britain and Northern Ireland, United States of America, Uruguay and Venezuela.

3. Representatives of the following specialized agencies attended the session: Food and Agriculture Organization of the United Nations (FAO), International Telecommunication Union (ITU), United Nations Industrial Development Organization (UNIDO) and the International Atomic Energy Agency (IAEA).

4. Representatives of the Association of Space Explorers (ASE), European Space Agency (ESA), Committee on Space Research (COSPAR) of the International Council of Scientific Unions (ICSU), International Astronautical Federation (IAF) and International Society for Photogrammetry and Remote Sensing (ISPRS) also attended the session.

5. A list of the representatives of Member States, specialized agencies and other international organizations attending the session is contained in document A/AC.105/C.1/INF.23.

6. On 21 February, the Subcommittee adopted the following agenda:

1. Adoption of the agenda.

2. Statement by the Chairman.

3. General exchange of views.

4. United Nations Programme on Space Applications and the coordination of space activities within the United Nations system.

5. Implementation of the recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE 82).

6. Matters relating to remote sensing of the Earth by satellites, including, *inter alia*, applications for developing countries.

7. Use of nuclear power sources in outer space.

8. Space debris.

9. Questions relating to space transportation systems and their implications for future activities in space.

10. Examination of the physical nature and technical attributes of the geostationary orbit; examination of its utilization and applications, including, *inter alia* in the field of space communications, as well as other questions relating to space communications developments, taking particular account of the needs and interests of developing countries.

11. Matters relating to life sciences, including space medicine.

12. Progress in national and international space activities related to the Earth environment, in particular progress in the geosphere-biosphere (global change) programme.

13. Matters relating to planetary exploration.

14. Matters relating to astronomy.

15. The theme fixed for special attention at the 1994 session of the Scientific and Technical Subcommittee: "Space applications for disaster prevention, warning, mitigation and relief."

16. Other matters.

17. Report to the Committee on the Peaceful Uses of Outer Space.

Meetings and documentation

7. The Subcommittee held 17 meetings.

8. A list of the documents which were before the Subcommittee is provided in annex I to the present report.

9. Following the adoption of the agenda, the Chairman made a statement outlining the work of the Subcommittee at its current session. He also reviewed the activities of Member States in the field of space exploration, including important advances that had been achieved as a result of international cooperation during the past year.

10. At the 431st, 435th and 440th meetings, the Chairman informed the Subcommittee that requests had been received from the permanent representatives of Algeria, Cuba, Finland, Israel, Nicaragua, Peru, Portugal, Republic of Korea, South Africa, Thailand, Turkey and Yemen to attend the session. Following past practice, those delegations were invited to attend the current session of the Subcommittee and to address it as appropriate. That

was without prejudice to further requests of that nature and did not involve any decision of the Subcommittee concerning status, but was a courtesy that the Subcommittee extended to those delegations.

11. General statements were made by the following delegations: Argentina, Australia, Austria, Brazil, Canada, Chile, China, Colombia, Cuba, Czech Republic, Ecuador, Egypt, France, Germany, Hungary, India, Indonesia, Iran (Islamic Republic of), Mexico, Morocco, Pakistan, Portugal, Romania, Russian Federation, South Africa, Sweden, Ukraine, United Kingdom of Great Britain and Northern Ireland and United States of America. General statements were also made by the representatives of ITU and ISPRS.

12. At the 431st meeting, the Director of the Office for Outer Space Affairs made a statement reviewing the work programme of the Office. At the 435th meeting, the Expert on Space Applications made a statement outlining the activities carried out and planned under the United Nations Programme on Space Applications.

Technical presentations

13. In accordance with paragraph 10 (b) (viii) of General Assembly resolution 48/39 of 10 December 1993, a symposium on the theme "Space applications for disaster prevention, warning, mitigation and relief" was organized by COSPAR and IAF to complement discussions within the Subcommittee on the special theme. The first session of the symposium, entitled "Space-based Earth observation and warning", was held on 21 February and was co-chaired by Mr. L. M. G. Enomoto, representing IAF, and Mr. S. Bauer, representing COSPAR. The second session of the symposium, entitled "Space-based prevention and mitigation", was held on 22 February and was co-chaired by Mr. A. Azcarraga, President, IAF, and Mr. H. Stoewer, representing COSPAR. Mr. R. Gibson of the IAF was the Rapporteur for both sessions of the symposium.

14. The presentations to the symposium included: "Space contributions" by Mr. L. Emiliani, Director, Observation of the Earth and its Environment, ESA; "Space observations for understanding (and predicting?) earthquakes and volcanic eruptions" by Mr. J. L. Le Mouël, Director, L'Institut de Physique du Globe de Paris; "Remote sensing of severe weather events" by Mr. W. P. Menzel, Space Science and Engineering Center, University of Wisconsin; "Desertification and land degradation" by Mr. Zheng Du, Institute of Geography, Chinese Academy of Sciences; "Floods and droughts" by Mr. U. R. Rao, Chairman, Indian Space Research Organization; "Global food security" by Mr. F. L. Snijders, Remote Sensing Centre, FAO; and "GEOWARN" by Mr. E. Slachmuylders, ISU/ESA-ESTEC and Mr. W. Neubert, Technische Universität, Vienna, Austria.

15. In response to General Assembly resolution 48/39, Mr. Walter Flury, ESA, Mr. K. Sridharamurthi, India, Mr. R. Crowther, DRA, United Kingdom, Mr. D. Rex, Germany, Mr. J. Loftus, Jr., Assistant Director, Johnson Space Center, National Aeronautic and Space Administration (NASA), and Mr. H. Laporte-Weywada, France, made special presentations on the complex issue of space debris and the solutions currently being adopted at the national level.

16. During the course of the session, scientific and technical presentations were made by Mr. K. Bowersox, Astronaut, NASA, and Mr. R. Albrecht, ESA, on the Space Shuttle mission to repair the Hubble Space Telescope and the first scientific results from the repaired telescope; Mr. M. G. Chandrasekar, India, on remote-sensing applications for sustaining bio-diversity; Mr. R. da Cunha, Instituto Nacional de Pesquisas Espaciais, on Brazilian space activities; Mr. B. Wade, Atomic Energy Agency, United Kingdom, on the use of nuclear power sources in outer space; Mr. U. Walter, Germany, Astronaut, DLR, on the flight of Spacelab D-2; Mr. C. Jung, France, on the remote-sensing activities of SPOT Image; Mr. L. Sehnal, Czech Republic, on the space microaccelerometer; Mr. P. Triska, Czech Republic, on the Czech Magion subsatellite programme; and Mr. D. McNally, International Astronomical Union (IAU), on the adverse environmental impacts on astronomy.

Recommendations of the Scientific and Technical Subcommittee

17. After considering the various items before it, the Subcommittee, at its 447th meeting, on 3 March 1994, adopted its report to the Committee on the Peaceful Uses of Outer Space containing its views and recommendations as set out in the paragraphs below.

I. UNITED NATIONS PROGRAMME ON SPACE APPLICATIONS AND THE COORDINATION OF SPACE ACTIVITIES WITHIN THE UNITED NATIONS SYSTEM

II. IMPLEMENTATION OF THE RECOMMENDATIONS OF THE SECOND UNITED NATIONS CONFERENCE ON THE EXPLORATION AND PEACEFUL USES OF OUTER SPACE

18. In accordance with General Assembly resolution 48/39, the Subcommittee continued its consideration of those items. In accordance with past practice, the Subcommittee considered the two items jointly.

19. The Subcommittee noted that the General Assembly, in paragraph 16 of resolution 48/39, had once again emphasized the urgency and importance of implementing fully the recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space as early as possible. The Subcommittee also took note of paragraph 11 of the same resolution, in which the General Assembly considered that, in the context of the Subcommittee's consideration of the item, it was particularly urgent to implement the following recommendations:

"(a) All countries should have the opportunity to use the techniques resulting from medical studies in space;

"(b) Data banks at the national and regional levels should be strengthened and expanded and an international space information service should be established to function as a centre of coordination;

"(c) The United Nations should support the creation of adequate training centres at the regional level, linked, whenever possible, to institutions implementing space programmes; necessary funding for the development of such centres should be made available through financial institutions;

"(d) The United Nations should organize a fellowship programme through which selected graduates or postgraduates from developing countries should get in-depth, long-term exposure to space technology or applications; it is also desirable to encourage the availability of opportunities for such exposure on other bilateral and multilateral bases outside the United Nations system."

20. In response to the recommendations of the Working Group of the Whole to Evaluate the Implementation of the Recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space, as contained in its report on the work of its seventh session, held in 1993 (A/AC.105/543, annex II, paras. 6-20), which were endorsed by the General Assembly in paragraph 13 of resolution 48/39, the Subcommittee had before it the following documents: a report on international cooperation in the peaceful uses of outer space; activities of Member States (A/AC.105/567 and Add.1, 2, 3 and 4), containing information submitted by Member States in response to paragraph 10 of the report of the Working Group; a technical study on the applications of space technology for forest resource management (A/AC.105/563), in response to paragraph 17 (b); and a technical study on the use of low Earth orbit satellites for voice communications (A/AC.105/564), in response to paragraph 17 (a). In addition, the Subcommittee had before it annual reports, including information in response to paragraph 11, submitted by the following international organizations: WMO (A/AC.105/569) and ITU.

21. In accordance with paragraph 12 of General Assembly resolution 48/39, the Subcommittee reconvened the Working Group of the Whole with a view to improving the execution of activities relating to international cooperation, particularly those included in the United Nations Programme on Space Applications, and to proposing concrete steps to increase such cooperation as well as to make it more efficient. The Working Group of the Whole

was chaired by Mr. Muhammad Nasim Shah (Pakistan); it held three meetings between 23 February and 2 March 1994 and adopted its report on 2 March 1994.

22. Having considered the report of the Working Group of the Whole, the Subcommittee decided at its 445th meeting, on 2 March 1994, to adopt that report, as contained in annex II to the present report, on the understanding that the recommendations contained therein would be carried out in accordance with paragraph 9 of General Assembly resolution 37/90 of 10 December 1982. The Subcommittee recommended that the Working Group be reconvened next year to continue its work.

A. United Nations Programme on Space Applications

23. Regarding the expanded United Nations Programme on Space Applications, the Subcommittee had before it the report of the United Nations Expert on Space Applications (A/AC.105/555). The report was supplemented by a statement by the Expert. The Subcommittee noted that the Programme on Space Applications for 1993 had been carried out satisfactorily and commended the work accomplished by the Expert in carrying out the work programme as endorsed by the Subcommittee at its last session.

24. The Subcommittee noted with appreciation that since its last session additional contributions had been offered by various Member States and organizations and that they had been acknowledged in paragraph 68 of the Expert's report.

25. The Subcommittee also noted with appreciation that, following its initiative in 1992, the Committee on the Peaceful Uses of Outer Space had requested the General Assembly to increase the budget allocation for the Programme on Space Applications so that the Programme would be able to implement fully the recommendations of UNISPACE 82. The Subcommittee expressed its satisfaction that, acting in response to those requests by the Committee and Subcommittee, the General Assembly, at its forty-eighth session, approved an additional budget allocation for the Space Applications Programme for the 1994-1995 biennium.

26. The Subcommittee continued to express its concern over the still limited financial resources available for carrying out the Programme and appealed to Member States to support the Programme through voluntary contributions. The Subcommittee felt that the limited resources of the United Nations should be focused on the highest priority activities and noted that the Programme on Space Applications was the priority activity of the Office for Outer Space Affairs.

1. 1993-1994

(a) United Nations training courses, workshops, conferences and symposia

27. With regard to the activities of the programme carried out in 1993, the Subcommittee expressed its appreciation to the following:

(a) The Government of Italy for co-sponsoring, through the United Nations Trust Fund for New and Renewable Sources of Energy, the United Nations/ESA Training Course for African Francophone Countries on Applications of ERS-1 Data for Natural Resources, Renewable Energy and the Environment, hosted by the ESA European Space Research Institute (ESRIN) and held at Frascati, from 19 to 30 April 1993;

(b) The Government of Sweden, represented by the Swedish Agency for International Technical and Economic Cooperation (BITS), for co-sponsoring the Third United Nations Training Course in Remote Sensing Education for Educators, hosted by Stockholm University and the Swedish Space Corporation Satellitbild and held at Stockholm and Kiruna, from 3 May to 4 June 1993;

(c) The Government of Greece, for co-sponsoring the United Nations Workshop on Space Communications for Development, hosted by the Ministry of Foreign Affairs through the Eugenides Foundation and the Hellenic Telecommunications Organization, and held at Athens, from 10 to 12 May 1993;

(d) The Government of Indonesia for co-sponsoring the United Nations/Indonesia Regional Conference on Space Science and Technology for Sustainable Development, hosted by the Indonesian International Space Year Committee, and held at Bandung, from 17 to 21 May 1993;

(e) The Government of Mexico, as well as ESA, for co-sponsoring the United Nations/ESA Workshop on Applications of Space Techniques to Prevent and Combat Natural Disasters, hosted by the National Autonomous University of Mexico, and held at Mexico City, from 27 to 30 September 1993;

(f) The Government of Germany, the Carl Duisberg Gesellschaft as well as ESA, for co-sponsoring the Fifth United Nations Regional Training Course on Remote Sensing Applications to Geological Sciences, hosted by the International Centre for Integrated Mountain Development (ICIMOD), and held at Kathmandu, from 10 October to 6 November 1993;

(g) The Government of Nigeria, as well as ESA, for co-sponsoring the Third United Nations/ESA Workshop on Basic Space Science, hosted by the National Agency for Science and Engineering Infrastructure, the University of Nigeria, Nsukka and Obafemi Awolowo University, Ile-Ife, and held at Lagos, from 18 to 22 October 1993;

(h) The Government of Senegal for assisting the United Nations in organizing the Regional Conference on Space Technology for Sustainable Development in Africa, and held at Dakar, from 25 to 29 October 1993.

28. The Subcommittee took note of the status of the planned United Nations workshops, training courses and conferences being held in 1994, which included the following activities, as described in annex III of the Expert's report:

(a) A United Nations/ESA Training Course for Latin American and Caribbean Countries on the Monitoring of Natural Resources, Renewable Energy and Environment using the ERS-1 Satellite to be organized jointly with the United Nations Department for Development Support and Management Services, and held at ESRIN, Frascati, from 18 to 30 April 1994;

(b) The Fourth United Nations/Sweden International Training Course on Remote Sensing Education for Educators, to be organized with the cooperation of the Government of Sweden and to be held at Stockholm and Kiruna, from 2 May to 10 June 1994;

(c) The Fourth United Nations/ESA International Workshop on Basic Space Science, to be held at Cairo, Egypt, from 27 June to 1 July 1994;

(d) A United Nations/COSPAR/Committee on Science and Technology in Developing Countries (COSTED) Symposium on Space Technology for Development, being organized in cooperation with the United Nations Environment Programme (UNEP) and the Third World Academy of Sciences, and to be held at Hamburg, in July 1994;

(e) A United Nations/Austria Workshop on Enhancing Social, Economic and Environmental Security through Space Technology, being organized in cooperation with the Government of Austria, the City of Graz, and ESA, to be held at Graz, from 12 to 15 September 1994;

(f) A United Nations/ESA Training Workshop on Microwave Remote Sensing Applications, being organized in cooperation with the Government of China, and to be held at Beijing, from 14 to 18 September 1994;

(g) A United Nations/ESA Workshop on the Application of Space Techniques to Prevent and Combat Natural Disasters, being organized for the benefit of ECA member States, to be held in September/October 1994;

(h) A United Nations/United States International Workshop on Spin-off Benefits of Space Technology: Challenges and Opportunities, being organized in cooperation with the Government of the United States of America;

(i) A United Nations/IAF/ESA Workshop on Space Activities for Economic Growth and Environmental Protection, being organized in cooperation with the Government of Israel, and to be held at Jerusalem, from 6 to 9 October 1994;

(j) A United Nations/ESA Regional Workshop on Remote Sensing Applications of Radar Technology to Environmental and Natural Resources Sciences, being organized in cooperation with the Government of Peru, and to be held at Lima, in September 1994;

(k) A United Nations/APSCC/Republic of Korea Workshop on Satellite Communications, being organized in cooperation with the Government of the Republic of Korea and the Asia Pacific Satellite Communications Conference, and to be held at Seoul, in November 1994;

(l) The Sixth United Nations/Carl Duisberg Gesellschaft Training Course on Remote Sensing Applications to Geological Sciences being organized for the benefit of Member States of the Economic Commission for Africa (ECA) region, in cooperation with the Government of Germany, and to be held in September/October 1994.

(b) Long-term fellowships for in-depth training

29. The Subcommittee expressed appreciation to the Governments of Brazil and China as well as to ESA for having offered training fellowships in various areas relating to space activities for the period 1992-1993. The Subcommittee once again expressed appreciation to those Governments and agencies for the renewal of fellowships for the period 1993-1994. The status of the 1992-1993 fellowships and the countries whose candidates have received fellowships were indicated in annex II of the Expert's report.

30. The Subcommittee noted that it was important to increase the opportunities for in-depth education in all areas of space science, technology and applications projects through long-term fellowships.

(c) Technical advisory services

31. The Subcommittee took note of the technical advisory services being provided by the Programme on Space Applications of the Office for Outer Space Affairs in support of regional space applications projects, as indicated in the report of the Expert:

(a) Collaboration with ESA on a survey and selection of projects to receive remote-sensing data made available by ESA to African countries covered by two ESA remote-sensing ground receiving stations at Maspalomas, Spain, and Fucino, Italy;

(b) Assistance to the Government of Ecuador in promoting regional operation, administration and funding of the remote-sensing receiving station at Cotopaxi, Ecuador;

(c) Assistance to the Government of Chile in its follow-up, as *pro tempore* secretariat, of the recommendations of the Second Space Conference of the Americas;

(d) Assistance to the Government of the Republic of Korea in the establishment of the Asia-Pacific Satellite Communications Conference.

(d) Promotion of greater cooperation in space science and technology

32. The Subcommittee noted that the United Nations was collaborating with international professional bodies in the space community to promote exchange of experience on space activities. In 1993, the Programme on Space Applications co-sponsored the following activities:

(a) The United Nations co-sponsored a United Nations/Austria/IAF/Commission of the European Economic Community/ESA Workshop on Organizing Space Activities in Developing Countries - Resources and Mechanisms, held at Graz, from 15 to 17 October 1993 in conjunction with the 44th IAF Congress.

(b) The United Nations co-sponsored the 4th International Symposium on the Application of Remote Sensing for Desertification Monitoring and Control, held in the Syrian Arab Republic, from 16 to 19 December 1993.

2. 1995

(a) United Nations training courses, workshops and symposia

33. The Subcommittee recommended the approval of the following programme of training courses, workshops and symposia proposed for 1995:

(a) The Fifth United Nations/Sweden International Training Course on Remote Sensing Education for Educators (Sweden);

(b) A United Nations/ESA International Microwave Remote Sensing Training Course (Frascati or Turin);

(c) A United Nations International Training Course on Communications Technology for Development;

(d) The Seventh United Nations Regional Training Course on Remote Sensing Applications to Geological Sciences;

(e) A United Nations Workshop on the Use of Space Techniques for Monitoring and Control of Desert Environment to be held for the benefit of Member States in the region of the Economic and Social Commission for Western Asia (ESCWA);

(f) The Fifth United Nations/ESA Workshop on Basic Space Science, to be organized for Member States in the region of the Economic and Social Commission for Asia and the Pacific (ESCAP);

(g) The Second United Nations Regional Conference on Space Technology for Sustainable Development, in the region of the Economic Commission for Africa (ECA);

(h) A United Nations Regional Conference on Space Technology for Sustainable Development in Latin America and the Caribbean (Mexico);

(i) A United Nations/International Astronautical Federation (IAF) Symposium on Space Technology in Developing Countries during the Forty-sixth Congress of IAF, in Norway.

B. International space information service

34. The Subcommittee noted with satisfaction that the Office for Outer Space Affairs was in the process of developing an international space information system, including both information within the United Nations system and access to external databases.

35. The Subcommittee noted with satisfaction the publication of documents entitled "Seminars of the United Nations Programme on Space Applications: Selected Papers on Remote Sensing, Satellite Communications and Space Science" (A/AC.105/568); and an updated edition of the "Directory on Education, Training, Research and Fellowship Opportunities in Space Science and Technology and its Applications" (A/AC.105/548). The Subcommittee also noted that the periodic publication "Space Activities of the United Nations and International Organizations (A/AC.105/521) was now available in all official languages of the United Nations.

C. Reports

36. The Subcommittee took note with appreciation of the reports submitted to it by Member States and international organizations in response to the recommendations of the Working Group of the Whole in its report on the work of its seventh session. It also noted with satisfaction that the Secretariat had prepared technical studies on space applications for forest resource management (A/AC.105/563) and on the use of low Earth orbit satellites for voice communications (A/AC.105/564).

D. Coordination of space activities within the United Nations system and inter-agency cooperation

37. The Subcommittee noted that the General Assembly, in resolution 48/39, had reaffirmed its request to all organs, organizations and bodies of the United Nations system and other intergovernmental organizations working in the field of outer space or on space-related matters to cooperate in the implementation of the recommendations of UNISPACE 82.

38. The Subcommittee noted with satisfaction that the Inter-Agency Meeting on Outer Space Activities had been convened by the Administrative Committee on Coordination at ITU headquarters in Geneva, from 11 to 13 October 1993, and that its report (A/AC.105/544) was before the Subcommittee. The Subcommittee took note of the information provided on the progress achieved in coordinating the space activities of the organizations of the United Nations system and expressed its appreciation for the report of the Secretary-General entitled "Coordination of outer space activities within the United Nations system: programmes of work for 1994 and 1995 and future years" (A/AC.105/551).

39. The Subcommittee continued to stress the necessity of ensuring continuous and effective consultations and coordination in the field of outer space activities among organizations within the United Nations system and the avoidance of duplication of activities. The Subcommittee noted that the next Inter-Agency Meeting on Outer Space Activities would be held in September 1994 at the United Nations Office at Vienna.

E. Regional and interregional cooperation

40. The Subcommittee noted that the General Assembly, in its resolution 48/39, had reaffirmed its approval of the recommendations of UNISPACE 82 regarding the establishment and strengthening of regional mechanisms of cooperation and their promotion and creation through the United Nations system. The Subcommittee noted with satisfaction that, in carrying out various activities in the implementation of the recommendations of UNISPACE 82, the Secretariat had sought to strengthen those mechanisms.

41. The Subcommittee noted with appreciation the efforts undertaken as part of the United Nations Programme on Space Applications, in accordance with the UNISPACE 82 recommendation concerning the development of indigenous capabilities, to establish regional centres for space science and technology education in existing national or regional educational institutions in developing countries, as outlined in the report of the Expert on Space Applications.

42. The Subcommittee noted with appreciation the offers by a number of Member States to host such regional centres and indications of support and participation from other Member States. The Subcommittee noted that evaluation missions concerning the establishment of such regional centres had been carried out in the Islamic Republic of Iran as well as in a number of potential host countries and institutions in Africa, and that representatives from potential supporting Governments had participated in the latter mission. The Subcommittee noted that similar evaluation missions were being planned for the ESCWA and ESCAP regions. The Subcommittee urged other Member States to support the establishment of the centres and requested the Office for Outer Space Affairs to make every possible effort to obtain the support of other relevant international organizations. The Subcommittee requested that it be kept informed of further developments on the subject.

43. The Subcommittee noted the contributions made by specialized agencies and other international organizations towards the promotion of international cooperation in space activities: FAO was continuing its activities relating to the remote sensing of renewable natural resources and environmental monitoring, including training courses and the support of development projects; ITU was continuing its work in the international coordination of space communications, including providing technical assistance to developing countries; WMO was continuing international cooperative programmes using space technology, including the World Weather Watch and the Tropical Cyclone Programme; UNESCO was promoting applications to space technology for archaeology and strengthening international and interdisciplinary cooperation between archaeological projects; UNIDO was continuing its work on spin-off benefits of space technology; INMARSAT was continuing to develop its satellite communication system for maritime, aeronautical and land-mobile communications, including the development of small, low-cost terminals and the provision of technical assistance and training; INTELSAT was further developing its system for international satellite communications and broadcasting, including its programmes for training and technical assistance; ESA was continuing its programme of international cooperative space activities, including training programmes for the benefit of developing countries, support of the activities of the United Nations Programme on Space Applications and technical assistance projects.

44. The Subcommittee emphasized the importance of regional and international cooperation in making the benefits of space technology available to all countries, through such cooperative activities as shared payloads, dissemination of information on spin-off benefits, ensuring compatibility of space systems and providing access to launch capabilities at reasonable cost.

III. MATTERS RELATING TO REMOTE SENSING OF THE EARTH BY SATELLITES INCLUDING, INTER ALIA, APPLICATIONS FOR DEVELOPING COUNTRIES

45. In accordance with General Assembly resolution 48/39, the Subcommittee continued its consideration of the item relating to remote sensing of the Earth.

46. In the course of the debate, delegations reviewed the national and cooperative programmes in remote sensing. Examples were given of national programmes in developing and developed countries and of international programmes based on bilateral, regional and international cooperation, including programmes of technical cooperation between developing countries. Countries with advanced capabilities in the field, including some developing countries, described programmes to provide assistance to other developing countries.

47. The Subcommittee took note of the continuing programmes of Australia, Brazil, China, France, India, Indonesia, Japan, Russian Federation, United States and ESA for remote-sensing satellites as well as the planned remote-sensing satellite system of Canada. The Subcommittee noted that the launches of the European Remote Sensing (ERS-1) satellite and the Japanese Earth Resources Satellite (JERS-1) would provide valuable microwave data to complement the multispectral data from satellites of the Landsat, Resurs, SPOT, Indian Remote Sensing (IRS) and Marine Observation Satellite (MOS) series. The Subcommittee also noted the remote-sensing systems being developed for future launch, including the IRS-1C of India, ADEOS-1 of Japan, SICH of Ukraine, FY-2 of China, SAC-C of Argentina and various systems of the Russian Federation. It also took note of the activities of FAO in remote sensing of renewable natural resources, including land-cover mapping and geographic information systems, of the work of WMO in the areas of weather forecasting and storm warning and of ISPRS in promoting international cooperation in remote sensing and image processing. The Subcommittee heard scientific and technical presentations on the remote-sensing activities of Brazil, France and India as described in paragraph 16 of the present report.

48. The Subcommittee reiterated its view that remote-sensing activities should take into account the need to provide appropriate and non-discriminatory assistance to meet the needs of the developing countries.

49. The Subcommittee emphasized the importance of making remote-sensing data and analysed information openly available to all countries at reasonable cost and in a timely manner. The Subcommittee also recognized the need for continuing free access to data from operational meteorological satellites.

50. The Subcommittee considered that international cooperation in the use of remote-sensing satellites should be encouraged, both through coordination of the operations of ground stations and through regular meetings between satellite operators and users. It noted the importance of compatibility and complementarity of existing and future remote-sensing systems as well as the need for continuity in the acquisition of data. The Subcommittee also noted the importance, particularly for the developing countries, of sharing experiences and technologies, of cooperation through international and regional remote-sensing centres and of joint work on collaborative projects. The Subcommittee also noted the value of remote-sensing systems for environmental monitoring and, in that context, stressed the need for the international community to utilize fully remote-sensing data in an effort to implement fully the recommendations contained in Agenda 21 (A/CONF.151/26/Rev.1) of the 1992 United Nations Conference on Environment and Development (UNCED).

51. Recalling General Assembly resolution 41/65, annex, of 3 December 1986, by which the Assembly had adopted the Principles Relating to Remote Sensing of the Earth from Outer Space, the Subcommittee recommended that at its thirty-second session it continue its discussion on remote-sensing activities conducted in accordance with those Principles, during its consideration of the agenda item concerning remote sensing.

52. The Subcommittee recommended that the item be retained on its agenda as a priority item for the next session.

IV. USE OF NUCLEAR POWER SOURCES IN OUTER SPACE

53. In accordance with General Assembly resolution 48/39, the Subcommittee continued its consideration of the item relating to the use of nuclear power sources in outer space.

54. The Subcommittee recalled that the General Assembly had adopted Principles Relevant to the Use of Nuclear Power Sources in Outer Space, as contained in resolution 47/68 of 14 December 1992. The Subcommittee noted that in Principle 11 on "review and revision", it was stated that the Principles should be reopened for revision by the Committee on the Peaceful Uses of Outer Space no later than two years after their adoption.

55. In accordance with General Assembly resolution 48/39, the Working Group on the Use of Nuclear Power Sources in Outer Space was reconvened to resume its work at the current session. The Working Group met from 1 to 3 March under the chairmanship of Professor J. H. Carver (Australia). At a meeting held on 3 March 1994, the Working Group adopted its report.

56. At its 446th meeting, on 3 March 1994, the Subcommittee adopted the report of the Working Group, which is contained in annex III to the present report.

57. The Subcommittee noted that in response to its recommendation, the General Assembly, in resolution 48/39, had invited Member States to report to the Secretary-General on a regular basis with regard to national and international research concerning the safety of satellites with nuclear power sources and other space objects with nuclear power sources on board. The Subcommittee also noted that the General Assembly, in the same resolution, had considered that, to the extent possible, information on the problem of collisions of orbiting space objects, including those with nuclear power sources on board, with space debris should be provided to the Scientific and Technical Subcommittee in order to allow it to follow that area more closely. The Subcommittee noted that information had been submitted in response to those requests, as contained in document A/AC.105/565 and Corr.1 and Add.1, 2 and 3, by China, Cuba, Finland, Germany, Ukraine and the United Kingdom.

58. The Subcommittee agreed that Member States should continue to be invited to report to the Secretary-General on a regular basis with regard to national and international research concerning the safety of

orbiting space objects with nuclear power sources. The Subcommittee also agreed that further studies should be conducted on the issue of the collision of orbiting space objects with nuclear power sources on board with space debris and that it should be kept informed of the results of such studies.

59. The Subcommittee took note of working papers submitted by the United Kingdom on revising the Principles Relevant to the Use of Nuclear Power Sources in Outer Space (A/AC.105/C.1/L.192), by the Russian Federation on nuclear power sources in outer space and space debris (A/AC.105/C.1/L.193), and by Sweden on the use of nuclear power sources in outer space (A/AC.105/C.1/L.197).

60. The Subcommittee took note of the offer made by the representative of IAEA during the discussions on the use of nuclear power sources in outer space and, considers that, if IAEA were to provide materials bearing on the Principles Relevant to the Use of Nuclear Power Sources in Outer Space, the Subcommittee and the Working Group on nuclear power sources would welcome such a contribution.

61. The Subcommittee expressed the view that the Principles Relevant to the Use of Nuclear Power Sources in Outer Space, as adopted in General Assembly resolution 47/68, should remain in their current form until such time as they are amended. Also, before amendment, proper consideration should be given to the aims and objectives of any proposed revision. To that end, it was considered that the Subcommittee and the Working Group on nuclear power sources should continue to receive the widest inputs on matters affecting the use of nuclear power sources in outer space and any contribution related to improving the scope and application, as well as better aligning the Principles with the relevant recommendations of IAEA and the International Commission on Radiological Protection (ICRP).

62. The Subcommittee recommended that the item be retained on its agenda for the next session, and that the time allocated to the topic in both the Working Group and the Subcommittee should be adjusted as appropriate.

V. SPACE DEBRIS

63. In accordance with resolution 48/39, the Subcommittee began its consideration of a new item on its agenda and considered scientific research relating to space debris, including relevant studies, mathematical modelling and other analytical work on the characterization of the space debris environment.

64. The Subcommittee expressed its satisfaction at having the subject of space debris as a separate agenda item after many years of discussion in various international forums, including the Subcommittee and the Committee. The Subcommittee agreed that consideration of space debris was important and that international cooperation was needed to evolve appropriate and affordable strategies to minimize the potential impact of space debris on future space missions.

65. In accordance with General Assembly resolution 48/39, paragraph 27, the Subcommittee agreed that Member States should pay more attention to the possible collision of orbiting space objects, including orbiting space objects with nuclear power sources on board, with space debris, and other aspects of space debris, noting that the Assembly, in the same resolution, had called for the continuation of national research on that question, for the development of improved technology for the monitoring of space debris and for the compilation and dissemination of data on space debris. The Subcommittee recalled the request of the Assembly that information on those issues should be submitted to the Scientific and Technical Subcommittee and took note of the reports submitted to it in accordance with that request as contained in documents A/AC.105/565, Corr.1 and Add.1, 2 and 3. The Subcommittee further agreed that national research on space debris should continue and that Member States should make the results of that research available to all interested parties.

66. The Subcommittee took note of the working paper submitted on space debris by the Russian Federation (A/AC.105/C.1/L.193), and the report of the IAF on space debris (A/AC.105/570).

67. The Subcommittee heard scientific and technical presentations on the subject of space debris by France, Germany, India, United Kingdom, United States and ESA, as described in paragraph 15 of the present report.

68. The Subcommittee noted that a certain amount of research on space debris had already been undertaken in some countries, which had allowed for a better understanding of the sources of debris, the areas in near-Earth orbit that were reaching high levels of space debris density, the probabilities and effects of collisions, and the necessity to minimize the creation of space debris.

69. The Subcommittee agreed that it was important to have a firm scientific and technical basis for future action on the complex attributes of space debris and that the Subcommittee should, *inter alia*, focus on understanding aspects of research related to space debris, including: debris measurement techniques; mathematical modelling of the debris environment, characterizing the space debris environment; and spacecraft design measures to protect against space debris.

70. The Subcommittee agreed that, in order to give structure to its consideration of that agenda item, it should focus its attention at the next session on the subject of acquisition and understanding of data on the characteristics of the space debris environment, with a view to establishing a common understanding that could serve as the basis for its further deliberations. To that end, COSPAR and IAF, as well as other relevant international organizations, should be invited to present relevant research to the Subcommittee. The Subcommittee encouraged Member States and relevant international organizations to provide information on practices that they had adopted and that had proven effective in minimizing the creation of space debris.

71. The Subcommittee agreed that at its next meeting it should develop a continuing, deliberate, specific multi-year plan for its work on that agenda item. The Subcommittee also agreed that, notwithstanding the selection of a specific topic for the next session, delegations wishing to address the Subcommittee at that time on other aspects of scientific research related to space debris should be free to do so.

72. Some delegations were of the view that the Legal Subcommittee should be informed of the discussions on that agenda item in the Scientific and Technical Subcommittee. Other delegations were of the view that that would not be appropriate.

73. The view was expressed that the Subcommittee should establish a working group to discuss space debris, as recommended in a working paper submitted by Poland at a previous session of the Subcommittee (A/AC.105/C.1/L.181). The view was also expressed that it was important for the Subcommittee to have a common understanding of the term "space debris".

74. The Subcommittee agreed to continue its consideration of the item at its next session.

VI. QUESTIONS RELATING TO SPACE TRANSPORTATION SYSTEMS AND THEIR IMPLICATIONS FOR FUTURE ACTIVITIES IN SPACE

75. In accordance with General Assembly resolution 48/39, the Subcommittee continued its consideration of the item relating to space transportation systems.

76. In the course of the discussion, delegations reviewed national and international cooperative programmes in space transportation systems, including expendable launchers, reusable space shuttles and space stations. In particular, the Committee noted that China was continuing the use and development of its Long March series of launch vehicles; that India was continuing development of the Augmented Satellite Launch Vehicle, the Polar Satellite Launch Vehicle and the Geostationary Satellite Launch Vehicle; that Japan had successfully launched the H-II launch vehicle and was continuing its development of the M-5 launch vehicle; that the Russian Federation had launched space objects of various types using expendable launchers of the Soyuz, Cosmos, Proton and other series, and had sent a number of national and international crews to the Mir space station; that Ukraine was continuing to produce, successfully use and improve the Tsyklon and Zenit rocket launchers; that the

United Kingdom was cooperating with the Russian Federation and Ukraine on the concept of the reusable interim HOTOL system and with ESA in its Future European Space Transportation Investigation Programme (FESTIP); that the United States was continuing its programme of expendable launches and flights of the reusable Space Shuttle and was developing the International Space Station in cooperation with Canada, Japan, the Russian Federation and ESA; and that ESA was continuing development of the Ariane series of launch vehicles.

77. The Subcommittee took note of developments in low-cost microsatellite technology and applications that could allow more countries to take an active part in space activities.

78. The Subcommittee stressed the importance of international cooperation in space transportation in order to provide all countries with access to the benefits of space science and technology.

79. The Subcommittee recommended that consideration of the item be continued at its next session.

VII. EXAMINATION OF THE PHYSICAL NATURE AND TECHNICAL ATTRIBUTES OF THE GEOSTATIONARY ORBIT; EXAMINATION OF ITS UTILIZATION AND APPLICATIONS, INCLUDING, IN THE FIELD OF SPACE COMMUNICATIONS, AS WELL AS OTHER QUESTIONS RELATING TO SPACE COMMUNICATIONS DEVELOPMENTS, TAKING PARTICULAR ACCOUNT OF THE NEEDS AND INTERESTS OF DEVELOPING COUNTRIES

80. In accordance with General Assembly resolution 48/39, the Subcommittee continued its consideration of the item relating to the geostationary orbit and space communications.

81. In the course of the discussion, delegations reviewed national and international cooperative programmes in satellite communications, including progress in communications satellite technology that would make satellite communications more accessible and less expensive and increase the communications capacity of the geostationary orbit and the electromagnetic spectrum.

82. The Subcommittee took note of the growing use of communications satellite systems for telecommunications, television broadcasting, data networks, environmental data relay, mobile communications, disaster warning and relief, telemedicine and other communications functions.

83. Some delegations expressed the view that the geostationary orbit was a limited natural resource and that saturation should be avoided in order to ensure that all countries had non-discriminatory access to the orbit. Those delegations felt that a special *sui generis* legal regime was required to ensure equitable access by all States, particularly developing countries. They felt that the roles of ITU, concerned with the technical aspects, and the Committee on the Peaceful Uses of Outer Space with respect to the geostationary orbit were complementary. Other delegations expressed the view that questions relating to the geostationary orbit were being addressed effectively by ITU.

84. Some delegations expressed the view that in considering the question of equitable access, account should be taken in particular of the characteristics of the equatorial countries.

85. Some delegations noted that the use of the geostationary orbit, like other orbits, was affected by the problem of space debris and that efforts were needed to minimize the generation of debris in the orbit and to move satellites shortly before the end of their useful lives into disposal orbits beyond the geostationary orbit. Other delegations noted that the risk of collision with space debris in the geostationary orbit remains very low and that it is far more important that satellites in geostationary orbit be made inert at the end of their useful life.

86. The Subcommittee noted a request that the study prepared by the Secretariat on the physical nature and technical attributes of the geostationary orbit, and its updates, the most recent of which was contained in document A/AC.105/404, should be brought to the attention of the Legal Subcommittee at its next session. The

Subcommittee also noted that the Committee on the Peaceful Uses of Outer Space, at its thirtieth session, had requested that the study continue to be brought up to date as required.

87. The Subcommittee recommended that consideration of the item relating to the geostationary orbit and space communications be continued at its next session.

VIII. PROGRESS IN NATIONAL AND INTERNATIONAL SPACE ACTIVITIES RELATED TO THE EARTH ENVIRONMENT, IN PARTICULAR PROGRESS IN THE GEOSPHERE-BIOSPHERE (GLOBAL CHANGE) PROGRAMME

88. In accordance with General Assembly resolution 48/39, the Subcommittee continued its consideration of the item concerning progress in national and international space activities related to the Earth environment, in particular progress in the International Geosphere-Biosphere (Global Change) Programme. The Subcommittee heard two special presentations on matters related to the agenda item by experts from the Czech Republic, as mentioned in paragraph 16 of the present report.

89. The Subcommittee noted that the Secretariat, at the request of the Committee and the General Assembly, had prepared an analytical study on the role that the Committee could play in view of the decisions and recommendations of the United Nations Conference on Environment and Development, held at Rio de Janeiro in June 1992 (see document A/AC.105/547). The Subcommittee further noted that, in response to the request of the Committee, the Secretariat had provided the Subcommittee with updated information on the implementation of Agenda 21 by the United Nations system, with information on the activities of the Programme on Space Applications related to environment and development, and with suggestions as to how the activities of the Programme in that area might be expanded (A/AC.105/547/Add.1). The Subcommittee welcomed those reports and agreed that they could serve as the basis for future discussions on that important matter within the Subcommittee and the Committee.

90. The Subcommittee noted the progress being made through international cooperation in the International Geosphere-Biosphere Programme, with the participation of many countries. It noted that such a joint international effort was of fundamental importance for examining the future habitability of the planet and for managing the common natural resources of the Earth. The Subcommittee took particular note of the need to involve as many countries as possible in the scientific activities of the Programme, both in developed and in developing countries.

91. The Subcommittee took note of the important contributions of satellite remote sensing for environmental monitoring, for planning sustainable development, for water-resource development, for monitoring crop conditions and for predicting and assessing drought.

92. The Subcommittee noted the important contribution of meteorological and atmospheric research satellites for studying global climate change, the greenhouse effect, the degradation of the ozone layer and other global environmental processes. The previously launched Topex/Poseidon oceanographic satellite, Upper Atmosphere Research Satellite, Total Ozone Mapping System, second Atmospheric Laboratory for Applications and Science (ATLAS-2) were important tools for that purpose, as would be the planned Phase II Mission to Planet Earth, Earth Observing System (EOS) series of spacecraft, the IRS series of spacecraft, ADEOS, Meteor and other similar spacecraft. The Subcommittee noted the need for further space research relating to climate change, weather patterns, vegetation distribution, storm and flood risk and other environmental factors.

93. The Subcommittee noted the importance of international cooperation in the various existing and planned satellite systems for environmental monitoring. It recommended that other States consider participating in such cooperative activities.

94. The Subcommittee recommended that consideration of the item be continued at its next session.

IX. MATTERS RELATING TO LIFE SCIENCES, INCLUDING SPACE MEDICINE

95. In accordance with General Assembly resolution 48/39, the Subcommittee continued its consideration of the item relating to life sciences.

96. The Subcommittee recalled that the General Assembly, in its resolution 48/39, had considered it particularly important that all countries should have the opportunity to use the techniques resulting from medical studies in space.

97. The Subcommittee noted that studies of human and animal physiology under the microgravity conditions of space flight had led to important advances in medical knowledge in such areas as blood circulation, sensory perception, immunology and the effects of cosmic radiation. It noted that important new information in those fields had been obtained through experiments on the Mir space station, particularly during the joint France-Russian Federation ANTARES missions, the SLS-2 mission of the United States Space Shuttle, the Germany-United States Spacelab D-2 mission, the European Recoverable Carrier (Eureca), the recoverable scientific experiment satellites of China, biological satellites and sounding rockets. The Subcommittee heard a special presentation by Dr. Ulrich Walter, a German astronaut on the Spacelab D-2 mission, as described in paragraph 16 of the present report.

98. The Subcommittee noted that applications of space technologies were demonstrating growing promise in medicine and public health on Earth. Satellite communications for telemedicine were providing expert medical advice to distant areas, as illustrated by the Telemedicine Spacebridge to Moscow linking medical centres in the United States and the Russian Federation. The Subcommittee also noted that products of space biotechnology, such as pharmaceutical and medical instruments, could contribute to improved health care. The Subcommittee noted the importance of space technology for those purposes and encouraged further research and exchange of information on those applications.

99. The Subcommittee noted that space studies in life sciences and medicine had important potential benefits for all countries and that efforts should be made to promote international cooperation to enable all countries to benefit from those advances.

100. The Subcommittee recommended that consideration of the item be continued at its next session.

X. MATTERS RELATING TO PLANETARY EXPLORATION AND MATTERS RELATING TO ASTRONOMY

101. In accordance with General Assembly resolution 48/39, the Subcommittee continued its consideration of the item on planetary exploration and the item on astronomy.

102. The Subcommittee noted that several planetary exploration missions were currently under way. The Magellan spacecraft had completed its systematic radar mapping programme of Venus and had started detailed measurements of its gravity field anomalies. The Galileo spacecraft, on its way to Jupiter, produced high-resolution images of asteroid 243 Ida. The ESA Ulysses spacecraft, following its swing-by trajectory from Jupiter, was studying the solar polar regions that had not been previously investigated. The Subcommittee noted plans for missions planned for future launch, including Mars 94, Mars Surveyor, Mars Environmental Survey (MESUR), Pathfinder, for investigation of Mars, Cassini/Huygens, for investigation of Saturn and its moons, and the Near-Earth Asteroid Rendezvous (NEAR) mission. The Subcommittee heard a special joint presentation by ESA and NASA on the successful mission to repair the Hubble Space Telescope and the first scientific results from the repaired telescope, as described in paragraph 16 of the present report. The Subcommittee noted the high degree of international cooperation in all of those investigations and stressed the need to further enhance international cooperation in planetary exploration to enable all countries to benefit from and participate in those activities.

103. The Subcommittee noted that the use of spacecraft for making astronomical observations from above the atmosphere had greatly advanced knowledge of the universe by allowing observations in all regions of the electromagnetic spectrum. It noted that with the Hubble Space Telescope, Rosat, Granat and Roentgen-Kvant X-ray observatories, Compton Gamma Ray Observatory, Extreme Ultraviolet Explorer, and Astro-D, Freja and Sampex satellites, and with data from the recent Stretched Rohini Scientific Satellite (SROSS-C) and ORFEUS-SPAS subsatellite, astronomers had powerful tools for their investigations of the universe. The planned launches of the Radioastron satellite, Spektr-Roentgen-Gamma observatory, Infrared Space Observatory, Advanced X-ray Astrophysics Facility, Space Infrared Telescope Facility, CRISTAS-SPAS subsatellite, Wind Spacecraft, Spektr-UV, Relict-2 and Scientific Applications Satellite (SAC-B) would open up further realms of the universe to detailed observation. The Subcommittee noted with satisfaction that all of those projects were open to broad international cooperation. The Subcommittee also heard a special presentation by the IAU on adverse environmental impacts on astronomy with special reference to the severe impact of electromagnetic pollution on radio astronomy and the effects of space debris on astronomical observations particularly at optical wavelengths.

104. The Subcommittee recommended that consideration of the items be continued at its next session.

XI. THE THEME FIXED FOR SPECIAL ATTENTION AT THE 1994 SESSION: SPACE APPLICATIONS FOR DISASTER PREVENTION, WARNING, MITIGATION AND RELIEF

105. In accordance with General Assembly resolution 48/39, the Subcommittee paid special attention to the theme "Space applications for disaster prevention, warning, mitigation and relief". The Subcommittee noted with satisfaction that, at its invitation, COSPAR and IAF had organized a symposium on the theme on 21 and 22 February 1994, as described in paragraphs 13 and 14 of the present report.

106. The Subcommittee took note of the important contributions that space-based systems, in particular, remote sensing and meteorological satellite systems, made towards international disaster warning and prevention efforts at the local, regional and global levels. The Subcommittee also took note with interest of the disaster-warning systems already in place in several countries and noted that those could serve as models for similar systems in other countries.

107. The Subcommittee noted the use of the Cospas/Sarsat search-and-rescue satellite system developed and operated on the basis of international cooperation. The Subcommittee recommended that countries not already participating in that programme consider doing so.

108. The Subcommittee noted the contributions of meteorological satellites to disaster warning and prevention efforts and noted that international cooperation in the sharing of meteorological data had been exemplary. The Subcommittee urged all countries to continue the practice of making data from their national satellite systems available to WMO in order to enhance the effectiveness of its meteorological and disaster-warning programmes.

XII. OTHER MATTERS

A. Third UNISPACE conference

109. In accordance with paragraph 22 of General Assembly resolution 48/39, the Subcommittee discussed the possibility of holding a third UNISPACE conference and, in accordance with paragraph 23 of the same resolution, those discussions focused on defining a set of sharply focused objectives for such a conference as well as details related to organization, venue, timing and funding. The Subcommittee also noted paragraph 24 of the same resolution, which stated that the goals set for such a conference might also be achieved by other means, including intensification of work within the Committee on the Peaceful Uses of Outer Space.

110. The Subcommittee noted the working papers on the possibility of holding a third UNISPACE conference submitted by Pakistan (A/AC.105/C.1/L.191) and India (A/AC.105/C.1/L.195) and considered the working paper submitted by the Group of 77 (A/AC.105/C.1/L.199), and agreed that those papers constituted a basis for further discussions on the matter.

111. The Subcommittee noted that these working papers outlined their rationales for a third UNISPACE conference, suggested several detailed objectives for such a conference and considered matters related to organization, funding, timing and venue. The Subcommittee also took note of the proposal made by the Government of India, as a developing country, to host a third UNISPACE conference at its Space Centre at Bangalore.

112. The Subcommittee agreed that the Committee should further consider the ideas and proposals contained in the working papers as well as such other ideas and proposals which may be submitted with a view to developing a set of sharply focused objectives and goals that address the needs and interests of all countries.

113. To further the discussions, the Subcommittee requested the Secretariat to prepare, in time for the next session of the Committee, a comprehensive report on the likely organization, funding and logistical implications of holding such a conference. The report should include an analysis of UNISPACE 82, including its organization, funding and logistics, as well as an analysis of various combinations of duration, scope and venue (including both United Nations headquarters cities and other sites) for a third UNISPACE conference.

114. The Subcommittee also noted the views expressed by the Group of 77 in its working paper and by other delegations on the objectives, venue, organization, timing and funding of a proposed third UNISPACE conference. The Subcommittee agreed that those matters should be decided by consensus.

115. The Subcommittee agreed that because of changes in the international environment which had a bearing on space programmes around the globe, and the many advances and changes in space technology and applications that had taken place since UNISPACE 82 was held in 1982, and the many benefits that have accrued as a result of that Conference, it was important to continue to discuss the possibility of holding a third UNISPACE conference with the widest possible participation and the potential benefits thereof.

116. The Subcommittee therefore agreed that the Committee should continue its discussions on all matters related to the holding of a third UNISPACE conference at its next session with a view to promoting an early conclusion on the matter.

B. Other reports

117. The Subcommittee welcomed the annual reports of WMO (A/AC.105/569) and the thirty-third report of ITU on telecommunications and the peaceful uses of outer space. The Subcommittee requested those organizations to continue to report on their work.

118. The Subcommittee expressed its appreciation to COSPAR for its report on the progress of space research and to IAF for its report on space technology and applications published jointly under the title "Highlights in Space: Progress in space science, technology and applications, international cooperation and space law" (A/AC.105/566).

119. The Subcommittee noted with appreciation the participation in its session of representatives from United Nations bodies, specialized agencies and permanent observers, and found their statements and reports helpful in enabling the Subcommittee to fulfil its role as focal point for international cooperation in space.

C. Review of the future role and work of the Scientific and Technical Subcommittee

120. The Subcommittee recommended that the agenda of its thirty-second session include the following priority items:

(a) Consideration of the Programme on Space Applications and the coordination of space activities within the United Nations system;

(b) Implementation of the recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE 82);

(c) Matters relating to remote sensing of the Earth by satellites including, *inter alia*, applications for developing countries;

(d) Use of nuclear power sources in outer space.

121. The Subcommittee also recommended that the agenda of its thirty-second session include the following items:

(a) Space debris;

(b) Questions relating to space transportation systems and their implications for future activities in space;

(c) Examination of the physical nature and technical attributes of the geostationary orbit; examination of its utilization and applications, including, *inter alia*, in the field of space communications, as well as other questions relating to space communications developments, taking particular account of the needs and interests of developing countries;

(d) Matters relating to life sciences, including space medicine;

(e) Progress in national and international space activities related to the Earth environment, in particular progress in the International Geosphere-Biosphere (Global Change) Programme;

(f) Matters relating to planetary exploration;

(g) Matters relating to astronomy;

(h) Consideration of the theme fixed for special attention at the thirty-second session of the Scientific and Technical Subcommittee: "Application of space technology for education with particular emphasis on its use in developing countries".

122. The Subcommittee recommended that, regarding agenda item (h) in paragraph 121 above, COSPAR and IAF, in liaison with Member States, should be invited to arrange a symposium, with as wide a participation as possible, to be held during the first week of the thirty-second session, to complement discussions by the Subcommittee on the special theme.

123. With regard to the dates for the thirty-second session, the Subcommittee recommended that it be scheduled from 20 February 1995.

Annex I

DOCUMENTS BEFORE THE SCIENTIFIC AND TECHNICAL SUBCOMMITTEE AT ITS THIRTY-FIRST SESSION

Item 1 - Adoption of the agenda

A/AC.105/C.1/L.190	Provisional agenda, with annotation, for the thirty-first session

Item 4 - United Nations Programme on Space Applications and the coordination of space activities within the United Nations system

Item 5 - Implementation of the recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space

A/AC.105/551	Coordination of outer space activities within the United Nations system: Programmes of work for 1994 and 1995 and future years
A/AC.105/552	Report on the Third United Nations Training Course on Remote-Sensing Education for Educators, held in cooperation with the Government of Sweden (Stockholm and Kiruna, Sweden, 2 May - 4 June 1993)
A/AC.105/553	Report of the United Nations Workshop on Space Communications for Development, organized in cooperation with the Government of Greece (Athens, Greece, 10-12 May 1993)
A/AC.105/554	Report of the Ad-Hoc Inter-Agency Meeting on Outer Space Activities (ITU Headquarters, Geneva, 11-13 October 1993)
A/AC.105/555	Report of the United Nations Expert on Space Applications
A/AC.105/556	Interim report on the United Nations/European Space Agency Training Course for Francophone African Countries on Applications of the European Remote Sensing Satellite Data for Natural Resources, Renewable Energy and the Environment (Frascati, Italy, 19-30 April 1993)
A/AC.105/557	Report on the United Nations Regional Conference on Space Science and Technology for Sustainable Development, organized in cooperation with the Government of Indonesia (Bandung, Indonesia, 17-21 May 1993)
A/AC.105/558	Report of the United Nations/European Space Agency Workshop on Applications of Space Techniques to Combat Natural Disasters, organized in cooperation with the Government of Mexico (Mexico City, 27-30 September 1993)
A/AC.105/559	Report on the United Nations/International Astronautical Federation Workshop on Organizing Space Activities in Developing Countries: Resources and Mechanisms, organized in cooperation with the Government of Austria (Graz, 15-17 October 1993)

A/AC.105/560	Interim report of the Third United Nations/European Space Agency Workshop on Basic Space Science for Developing Countries (Lagos, Nigeria, 18-22 October 1993)
A/AC.105/561	Interim report on the Fifth United Nations/Carl Duisberg Gesellschaft/European Space Agency Training Course on Remote-sensing Applications to Geological Sciences: The Planning and Management of the Environment, Natural Resources and the Physical Infrastructure (Kathmandu, Nepal, 10 October - 6 November 1993)
A/AC.105/562	Report on the United Nations Regional Conference on Space Technology for Sustainable Development in Africa (Dakar, Senegal, 25-29 October 1993)
A/AC.105/566	Seminars of the United Nations Programme on Space Applications: selected papers on remote sensing, satellite communications and space science
A/AC.105/567 and Add.1, 2, 3 and 4	Implementation of the recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space
A/AC.105/568	Seminars of the United Nations Programme on Space Applications: selected papers on remote sensing, satellite communications and space science, 1994

Item 7 - Use of nuclear power sources in outer space

Item 8 - Space debris

A/AC.105/565 and Corr.1 and Add.1 and 2	National research on space debris: safety of nuclear-powered satellites: problems of collisions of nuclear power sources with space debris
A/AC.105/C.1/L.192	Use of nuclear power sources in outer space: working paper submitted by the United Kingdom of Great Britain and Northern Ireland
A/AC.105/C.1/L.193	Use of nuclear power sources in outer space: space debris: working document submitted by the Russian Federation
A/AC.105/C.1/L.194	Use of nuclear power sources in outer space: working document submitted by the Russian Federation
A/AC.105/C.1/L.197	Nuclear power sources (NPS): working paper: Sweden
A/AC.105/C.1/WG.5/L.32	Draft report of the Working Group on the Use of Nuclear Power Sources in Outer Space on the work of its eleventh session

Item 10 - Examination of the physical nature and technical attributes of the geostationary orbit; examination of its utilization and applications, including, *inter alia*, in the field of space communications, as well as other questions relating to space communications developments, taking particular account of the needs and interests of developing countries

Item 12 - Progress in national and international space activities related to the Earth environment, in particular progress in the Geosphere-Biosphere (Global Change) Programme

A/AC.105/547/Add.1	The role of the Committee on the Peaceful Uses of Outer Space in implementing the recommendations of the United Nations Conference on Environment and Development

Item 15 - The theme fixed for special attention at the 1994 session of the Scientific and Technical Subcommittee: "Space applications for disaster prevention, warning, mitigation and relief"

A/AC.105/C.1/L.196	Working paper: Russian Federation: The COSPAS-SARSAT International Search and Rescue Satellite System

Item 16 - Other matters

(a) Third UNISPACE

A/AC.105/C.1/L.191	Other matters: Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space: Pakistan working paper
A/AC.105/C.1/L.195	Preliminary concept paper for UNISPACE III: working paper: India
A/AC.105/C.1/L.199	Working paper submitted by the Group of 77

(b) Other reports

A/AC.105/566	Highlights in space: Progress in space science, technology and applications, international cooperation and space law, 1993
A/AC.105/569	Report of the World Meteorological Organization
A/AC.105/570	Report of the International Astronautical Federation

Working Group of the Whole to Evaluate the Implementation of the Recommendations of UNISPACE 82

A/AC.105/563	Space applications for forest resource management
A/AC.105/564	Use of low Earth orbit satellites for voice communications
A/AC.105/C.2/WG.6/L.9	Draft report of the Working Group of the Whole to Evaluate the Implementation of the Recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space on the work of its eighth session

Annex II

REPORT OF THE WORKING GROUP OF THE WHOLE TO EVALUATE THE IMPLEMENTATION OF THE RECOMMENDATIONS OF THE SECOND UNITED NATIONS CONFERENCE ON THE EXPLORATION AND PEACEFUL USES OF OUTER SPACE ON THE WORK OF ITS EIGHTH SESSION

1. The Working Group of the Whole to Evaluate the Implementation of the Recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE 82) was re-established for its eighth session by the Scientific and Technical Subcommittee in accordance with General Assembly resolution 48/39 of 10 December 1993, paragraph 12, with a view to improving the execution of activities relating to international cooperation, particularly those included in the United Nations Programme on Space Applications, and to proposing concrete steps to increase such cooperation as well as to make it more efficient. The Working Group held a series of meetings from 23 February to 2 March 1994, during the thirty-first session of the Scientific and Technical Subcommittee. At its meeting on 2 March 1994, the Working Group adopted the present report.

2. Mr. Muhammed Nasim Shah (Pakistan) was elected Chairman of the Working Group. The Chairman, in his opening statement, reviewed the mandate of the Working Group for its eighth session and the status of the implementation of the recommendations of UNISPACE 82.

3. In accordance with paragraph 12 of resolution 48/39, the Working Group of the Whole continued its assessment of the implementation of the recommendations of UNISPACE 82. The Working Group had before it a number of studies and reports prepared by the Secretariat, Member States and international organizations, contained in documents A/AC.105/555, A/AC.105/563, A/AC.105/564, A/AC.105/567, Add.1, 2, 3 and 4.

4. The Working Group noted with satisfaction the valuable efforts of the United Nations, Member States and other international organizations to implement the recommendations of UNISPACE 82.

5. The Working Group agreed on the following conclusions and recommendations, keeping in view the priorities contained in paragraph 10 of General Assembly resolution 48/39.

I. SHORT-TERM TRAINING AND LONG-TERM EDUCATION

6. The Working Group noted that training courses in remote sensing, satellite communications and other topics have been organized for the benefit of developing countries with the assistance of the United Nations. Such seminars and workshops on advanced applications of space science and technology and on new technological developments should continue to be organized regularly. At the same time, the recent advances in space technologies and applications for development should be brought to the attention of planners, administrators and decision makers in the developing countries. Member States, particularly the developed countries, and international organizations are requested to support the training programme on an ongoing basis.

7. The Working Group recommended that the emphasis of the United Nations Programme on Space Applications should remain on long-term, project-oriented, on-the-job training in space technology as well as in specific applications areas, with emphasis on new developments in satellite systems, software for remote sensing, use of digital processing and geographical information systems and training in the management and operation of ground stations. In order to facilitate the development of indigenous research-and-development capabilities by the developing countries, the number of trainees from each country should be sufficient to create a national core group of experts. The Working Group noted with appreciation the offers of fellowships for long-term training made by some Member States and international organizations and urged other Member States and international organizations to make similar offers. The Working Group noted with concern that although UNISPACE 82 had recommended

that at least 100 fellowships be made available each year, the actual number of fellowships available had been far below that target and was currently in the order of 20 per cent of it. The Working Group urged the Office for Outer Space Affairs to make every effort to arrange for an increase in the number of fellowships and to encourage full utilization of the available fellowships.

8. The Working Group encouraged Member States to introduce or to improve space science, technology and applications curricula in their existing universities and institutions at appropriate levels.

II. INTERNATIONAL AND REGIONAL COOPERATION

9. The Working Group noted with appreciation the efforts being made by the United Nations towards the establishment in developing countries of regional centres for space science and technology education linked to institutions with space-related programmes, as described in the report of the Expert on Space Applications (A/AC.105/555). The Working Group noted that a number of countries in each region had offered to host the proposed centres, and that missions to evaluate potential host institutions had taken place in two regions and that evaluation missions in other regions were planned. The Working Group considered that the process for selecting the host countries should take into account the need to ensure the long-term viability of the centres and the need for the participation and support of other countries in the region concerned. Bearing in mind the recommendations of UNISPACE 82, the Working Group urged the United Nations to continue its efforts to arrange funding and other support, in addition to that being provided by the host countries, from the developed countries as well as from international organizations for the establishment and operation of the centres.

10. The Working Group recommended that in the light of the continued development of space activities, the Committee on the Peaceful Uses of Outer Space should request all States, particularly those with major space or space-related capabilities, to continue to inform the Secretary-General annually, as appropriate, about those space activities that were or could be the subject of greater international cooperation, with particular emphasis on the needs of the developing countries.

11. Similarly, the Committee should also request international organizations with space-related activities to continue to inform the Secretary-General annually concerning those space activities that were or could be the subject of greater international cooperation, with particular emphasis on the needs of the developing countries.

12. Extensive cooperation should be encouraged among countries within each region through sharing their human resources, technical expertise, hardware and software for space-related projects. If a country or countries within a region found it beyond their resources to undertake a programme by themselves, the United Nations should, upon request, endeavour to cooperate with them towards establishing a regional programme addressing the needs of those countries. Both regional and interregional cooperation between developing countries with similar needs, experiences and problems should be encouraged.

13. Encouragement should be given to governmental as well as non-governmental organizations which could help to integrate regional and interregional efforts by means of conferences, publications and other activities, including symposia and meetings devoted to special topics, in order to facilitate and coordinate the space activities of scientific organizations. The United Nations should strengthen its cooperation with such organizations as part of its commitment to assisting developing countries to attain the benefits of space technology, including its spin-offs. Efforts should also be made by the United Nations to seek the cooperation of other international and regional bodies specializing in space activities.

14. Countries with relevant capabilities are once again encouraged to provide to the developing countries financial and technical assistance for developing low-cost community receivers for communication satellites and low-cost, preferably renewable, power sources to operate such receivers in unelectrified locations.

15. The Working Group noted with appreciation the reports prepared by the Office for Outer Space Affairs on the resources and technological capabilities of States in space activities as well as in the areas of education, training,

research and fellowship opportunities for the promotion of cooperation in the peaceful uses of outer space. Those reports should continue to be periodically updated by the Office for Outer Space Affairs.

16. Given the investments already made on the ground by many countries in the form of ground stations, processing equipment, data banks, software etc. for remote-sensing data reception and analysis, satellite-operating States were urged to ensure the availability of data on a continuing basis and in a form compatible with the current systems.

III. INFORMATION, STUDIES AND TECHNICAL ADVISORY SERVICES

17. The Working Group appreciated the preparation by the Secretariat of a number of studies and reports on space science, technology and applications as requested by the Working Group at its previous sessions. The Working Group recommended that further studies should be undertaken by the Office for Outer Space Affairs, as appropriate, in view of the recommendations adopted at the workshops, seminars, symposia and conferences organized by the United Nations Programme on Space Applications. Those studies might include the following:

(a) Space applications for sustainable development;

(b) Satellite-based radio broadcasting services;

(c) Developing tele-education programmes through international cooperation;

(d) Basic space science in developing countries;

(e) Use of remote sensing technologies for environmental applications, particularly in support of the recommendations of the United Nations Conference on Environment and Development;

(f) Global change: actual participation of the developing countries and possibilities of enhancing it;

(g) Small microsatellites: current projects and future perspectives for international cooperation;

(h) Global exchange of scientific and technical information: networking possibilities for developing countries.

In preparing the above studies, the Office for Outer Space Affairs may seek input from interested Member States.

18. In order to promote the development of national space programmes, including higher education in space-related subjects, the United Nations should continue to arrange, upon request, for the provision of expert consultants from developed and developing countries to assist in the preparation of integrated national plans of action for initiating, strengthening or reorienting appropriate space applications programmes, which should be in conformity with other national development programmes. The Working Group requested the Office for Outer Space Affairs to update the list of experts in space technology and applications, contained in document A/AC.105/460, on the basis of information provided by Member States and their national space authorities, to facilitate the exchange of consultants at the international level. The updated list should be circulated to Member States.

IV. OTHER MATTERS

A. Priority areas

19. The Working Group considered that the following areas should be given priority in further efforts to promote the applications of space science and technology for development:

(a) Stimulation of the growth of indigenous nuclei and an autonomous technological base in space technology in developing countries. UNISPACE 82 had recommended the free exchange of scientific and technological information and an arrangement for the transfer of technologies to promote the use and development of space technology in the developing countries. UNISPACE 82 had also recommended that countries should not place undue restrictions on the sale of components, subsystems or systems required for peaceful space applications. A greater international understanding therefore needs to be evolved to overcome the difficulties faced by the developing countries in this respect;

(b) Promotion of greater exchange of actual experiences in space applications. UNISPACE 82 had recommended appropriate assistance and had called particularly upon international financial agencies to support demonstration projects to provide opportunities for hands-on experience in space technology and applications for the developing countries through direct involvement in such applications projects or pilot projects;

(c) United Nations funding. The Working Group noted with appreciation that, following its recommendation to the Subcommittee at its session in 1992, the Committee on the Peaceful Uses of Outer Space had requested the General Assembly to increase the budget allocation for the Programme on Space Applications so that the Programme would be able to more fully implement the recommendations of UNISPACE 82. The Working Group expressed its satisfaction that the General Assembly, at its forty-eighth session, acting in response to those requests, had approved an additional budget allocation for the Programme on Space Applications. The Working Group further reaffirmed its view that the Programme on Space Applications should be given the full support of the United Nations in order to fully implement the recommendations of UNISPACE 82. That recommendation was made on the understanding that the Office for Outer Space Affairs would give priority to the full implementation of the Programme on Space Applications within the available resources of its regular budget;

(d) Voluntary contributions. The Working Group expressed its appreciation for the support from Member States and international organizations in the form of cash and in-kind contributions for the activities being undertaken by the Programme on Space Applications for the implementation of the UNISPACE 82 recommendations. The Working Group requested those Member States and international organizations to continue their support and urged other Member States and international organizations to provide cash and in-kind contributions for Programme activities.

B. Third UNISPACE

20. The Working Group of the Whole noted that the General Assembly, in paragraph 22 of resolution 48/39, had requested the Subcommittee to continue, at its thirty-first session, the discussions held at the previous session of the Committee on the Peaceful Uses of Outer Space on the possibility of holding a third UNISPACE conference, with a view to promoting an early conclusion on the matter by the Committee. The Working Group further noted that the General Assembly, in paragraph 23 of the same resolution, had agreed that the most important step was to define a set of sharply focused objectives for such a conference and that details such as organization, venue, timing and funding should also be considered. The Working Group also noted paragraph 24 of the same resolution which stated that the goals for such a conference might also be achieved by other means, including intensification of work within the Committee on the Peaceful Uses of Outer Space.

21. In that connection, the Working Group of the Whole noted the working papers submitted by India (A/AC.105/C.1/L.195) and Pakistan (A/AC.105/C.1/L.191) on the possibility of holding a third UNISPACE conference and considered the working paper submitted by the Group of 77 (A/AC.105/L.199) on the subject. The Working Group agreed that those papers constituted a basis for further discussions on the matter in the Subcommittee. The Working Group of the Whole also noted that the subject of the third UNISPACE Conference was discussed by the Subcommittee.

C. Future work

22. The Working Group recommended that it be reconvened next year to continue its work.

Annex III

REPORT OF THE WORKING GROUP ON THE USE OF NUCLEAR POWER SOURCES IN OUTER SPACE ON THE WORK OF ITS ELEVENTH SESSION

1. The Working Group on the Use of Nuclear Power Sources in Outer Space, reconvened in accordance with General Assembly resolution 48/39 of 10 December 1993, paragraph 14, held its eleventh session at the United Nations Office at Vienna from 1 to 3 March 1994 under the chairmanship of Mr. J. H. Carver (Australia), during the thirty-first session of the Scientific and Technical Subcommittee.

2. The Working Group held three meetings and adopted the present report at its meeting on 3 March 1994.

3. The Working Group again expressed its satisfaction that, after many years of work in the Subcommittee and Committee, the Principles Relevant to the Use of Nuclear Power Sources in Outer Space had been adopted by the General Assembly in its resolution 47/68 of 14 December 1992.

4. The Working Group noted that the Principles Relevant to the Use of Nuclear Power Sources in Outer Space provided that they should be reopened for review and revision by the Committee on the Peaceful Uses of Outer Space no later than two years after their adoption. None the less, the Working Group noted that the Principles had been adopted by the General Assembly and would remain in their current form until such time as they were amended.

5. The Working Group noted, *inter alia*, that space applications using nuclear power in space were continuing to develop, that international recommendations on radiological protection were continuing to evolve and that the adopted Principles were limited in scope.

6. The Working Group noted that the General Assembly, in paragraph 14 of resolution 48/39, had invited Member States to report to the Secretary-General on a regular basis with regard to national and international research concerning the safety of nuclear-powered satellites and other objects with nuclear power sources on board and that a number of Member States had submitted information as contained in document A/AC.105/565 and Corr.1 and Add.1 and 2.

7. The Working Group took note of working papers submitted by the United Kingdom of Great Britain and Northern Ireland on revising the Principles Relevant to the Use of Nuclear Power Sources in Outer Space (A/AC.105/C.1/L.192), by the Russian Federation on nuclear power sources in outer space (A/AC.105/C.1/L.194), and by Sweden on the use of nuclear power sources in outer space (A/AC.105/C.1/L.197). The Working Group agreed that the working papers and other information provided by Member States were useful for continuing discussions on that matter.

8. A number of questions relating to possible ways of revising the Principles were raised in the Working Group, including a further definition of terms, expanding the scope of the Principles to other uses of nuclear power in space, criteria for acceptable risk, the applicability of probabilistic risk assessment, the applicability of fundamental nuclear safety principles, the adoption of a safety culture by those carrying out nuclear-powered space activities, the effect of space debris on the safety of nuclear power sources and the application of the relevant recommendations of the International Atomic Energy Agency (IAEA), and the International Commission on Radiological Protection (ICRP).

9. The Working Group also noted the offer made by the representative of IAEA, during the discussions on the use of nuclear power sources in outer space, and considered that if IAEA were to provide materials bearing on the Principles Relevant to the Use of Nuclear Power Sources in Outer Space, the Subcommittee would welcome such a contribution.

10. The Working Group also agreed that proper consideration of the aims and objectives of any revision of the Principles should be agreed before specific revisions were considered.

11. The Working Group recommended that it be reconvened for an appropriate period the following year to continue its work.